

KAMARAJ COLLEGE (Autonomous)

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(Affiliated to Manonmaniam Sundaranar University, Tirunelveli)

(5 Pages)

Reg. No:.....

Question Code: 26E04209

Course Code : 25PMBA21

PG Degree - End Semester Examinations, April 2026

Second Semester

M.B.A

Applied Operations Research

(For those who joined in June 2025 onwards)

Time : 3Hours

Maximum : 75 Marks

PART - A (5 × 4 = 20 Marks)

Answer ALL Questions

Answer should not exceed 250 words.

- CO:1 1. Define Operations Research. Explain any two characteristics of
K:1 OR models.
- CO:2 2. State the assumptions of a transportation problem.
K:1
- CO:3 3. Infer the term assignment problem and explain how it is
K:2 different from a transportation problem.
- CO:4 4. Define Critical Path and Float in network analysis.
K:1
- CO:5 5. Illustrate the term two-person zero-sum game and interpret
K:2 the term mixed strategy.

PART - B (5 X 8 = 40 Marks)

Answer ALL Questions choosing either (a) or (b).

Answer should not exceed 500 words.

- CO:1 6. (a) A company produces two products A and B. Profit per unit is
K:3 ₹40 and ₹30 respectively. Each unit of A requires 2 hours of machine time and 1 hour of labor. Each unit of B requires 1 hour of machine time and 2 hours of labor. Available machine time is 100 hours and labor time is 80 hours.

(OR)

- (b) Explain the steps in LPP model formulation and illustrate with a suitable example.

- CO:2 7. (a) Solve the following transportation problem using North-West Corner Rule and test optimality using MODI method.
K:4

	D1	D2	D3	Supply
S1	4	6	8	20
S2	5	7	6	30
S3	6	5	7	25
Demand	25	30	20	

(OR)

- (b) Use Vogel's Approximation Method (VAM) to find an initial basic feasible solution for the following transportation problem:

	D1	D2	D3	Supply
S1	8	6	10	20
S2	9	7	4	30
S3	3	4	2	25
Demand	30	25	20	

- CO:3 8. (a) Solve the following assignment problem using the Hungarian Method:
K:4

	J1	J2	J3	J4
A	9	2	7	8
B	6	4	3	7
C	5	8	1	8
D	7	6	9	4

(OR)

- (b) Four jobs must be processed on two machines. Processing times (in hours) are:

Job	M1	M2
J1	4	7
J2	8	3
J3	5	6
J4	2	5

Determine the optimal job sequence.

- CO:4 9. (a) A project has the following activities:

K:3

Activity	Predecessor	Time (days)
A	—	3
B	A	5
C	A	4
D	B, C	6
E	C	2

Construct the network, find the critical path and project duration.

(OR)

(b) Explain the three time estimates in PERT. How is expected time calculated?

CO:5 10. (a) Solve the following game using graphical method:

K:4

	B1	B2
A1	2	4
A2	6	1

Find optimal mixed strategies.

(OR)

(b) Solve the following two-person zero-sum game using Linear Programming method:

	B1	B2	B3
A1	3	2	4
A2	1	5	2

Formulate the game as an LPP and determine the optimal mixed strategies and value of the game.

PART - C (1 X 15 = 15 Marks)

CO:5 11. Case Study:

K:4 Advertising Strategy of Competing EdTech Firms

In India's fast-growing online education market, two EdTech companies — LearnFast and BrightMind — are competing to attract MBA aspirants preparing for entrance exams.

Both companies are planning their digital advertising strategy for the upcoming admission season. Each firm has two advertising choices:

Strategy 1: Heavy Social Media Advertising
Strategy 2: Influencer + YouTube Advertising

The success of each firm depends not only on its own strategy but also on the competitor's strategy. Market studies show:

- If both use Social Media Ads, competition becomes intense and returns are moderate.
- If both use Influencer + YouTube, audience overlap reduces impact, leading to average results.
- If one uses Social Media while the other uses Influencers, the one using Social Media captures more immediate leads, while the other builds long-term brand trust but gains fewer short-term enrollments.

After analysis, the management team converts expected outcomes into a payoff matrix (in profit index units):

	BrightMind: Social Media	BrightMind: Influencer
LearnFast: Social Media	4, 4	8, 2
LearnFast: Influencer	2, 8	6, 6

The first number in each cell is LearnFast's payoff and the second is BrightMind's payoff.

Management observes that no strategy pair gives a stable pure strategy solution, because each firm can improve its payoff by changing its strategy depending on the opponent's action.

Thus both firms consider using mixed strategies — selecting strategies with certain probabilities.

Questions:

1. Identify why this game has no saddle point.
2. Formulate the problem as a two-person zero-sum game (assume suitable transformation if required).
3. Determine the optimal mixed strategy probabilities for LearnFast.
4. Determine the optimal mixed strategy probabilities for BrightMind.